Terebratula aspera (Schlotheim) of the Eifel. President Haughton says, "It is therefore highly probable that the coal-beds of Melville Island are very low down in the series, and do not correspond in geological position with the coal-beds of Europe, which rest on the summit of the carboniferous beds." The coal itself in some respects resembles some of the gas-coals of Scotland, which form a system older than that of the South Welsh coals. The corals, collected apparently from the same beds, are a curious mixture of silurian and carboniferous types. "The same blending of corals has been found in Ireland, the Bas Boulonnais, and in Devonshire." He concludes by saying, "I do not believe in the lapse of a long interval of time between the silurian and carboniferous deposits,—in fact, in a Devonian period."

Mr. Lesley described the subconglomeritic or false coal measures, first recognized stratigraphically by Dr. R. M. S. Jackson in Northwestern Virginia, in 1841, and botanically by Leo Lesquereux, in 1851; the system being best developed in Wythe and Montgomery Counties in Southern Virginia, in Southeastern Kentucky, and in Nova Scotia. He considered it probable that this earlier carboniferous era, illustrated in Ireland, Scotland, and elsewhere further east by workable coal-beds, would determine the age of the Arctic coal-field. The carbonaceous slate deposit of the lowest Devonian rocks, such as have been searched for coal in Perry and Juniata Counties, Pennsylvania, and have actually yielded thin coal-seams in Western New York, may better represent the German Devonian coal-measures.

Stated Meeting, March 16, 1860.

Present, sixteen members.

President Dr. Wood, in the Chair.

Letters were read from the Oberlausitzischen Gesellschaft, dated Görlitz, Dec. 21, 1859, requesting information; from

the Chicago Historical Society, dated February 29, 1860, desiring to form and sustain friendly relations with the Society; and from the Editor of the Gas Light Journal, dated New York, March 13, 1860, offering to sell a printing press, said to be the one on which Benjamin Franklin worked when a boy of fourteen years of age. On motion of Mr. Fraley, the offer was declined. On motion of Dr. Bache, the Chicago Historical Society was placed on the list of corresponding societies.

The following donations for the Library were announced:—

Reinwald's Catalog. Annuel. Vol. ii. Paris, 1859.—*From the Author.*
Bulletin Soc. Geog. Paris, xvii. Jan. to June, 1859.—*From the So.*
Robinson's Armagh Cat. of 5345 Stars. 8vo. 1859.—*From the Aut.*
Cat. of Printed Books of N. Y. Hist. S. Lib. 8vo. 1859.—*From So.*
Journal of the Franklin Institute, No. 411.—*From the Institute.*
Mayor Henry's 2d An. Mes. Phil. 1860.—*From City Councils.*
African Repository. March, 1860.—*From Amer. Col. Society.*
Saggio di Ditterologia Messicana di Luigi Bellardi. Part 1. 4to. Torino, 1859.—*From the Author.*

Mr. Lea read a letter from Dr. James Lewis, of Mohawk, N. Y., accompanied by drawings descriptive of a self-registering thermometer, registering on a fillet of paper, with a pricking point, at intervals as short as fifteen minutes if desired.

REGISTERING THERMOMETER. BY JAMES LEWIS, MOHAWK, N. Y.

The apparatus, for convenience of description, may be divided into three parts.

First. The Thermometer, consisting of a bundle of iron and brass wires (No. 13 wire measure), which bundle comprises, within a length of *about* 15 inches, the equivalent of about 45 inches of iron wire antagonized by an equal length of brass wire. These wires are arranged *around* a centre, instead of being placed in alternate pairs each side of a centre, for the purpose of making each individual wire contribute its share of stiffness to the stiffness of the whole bundle; also for the purpose of giving equal rigidity to the *circular plates* which

connect the wires at their extremities, so as to avoid as much as possible the elasticity which is being constantly multiplied by arranging the rods at unequal distances from the centre in a straight line each side of the centre.

The whole number of rods or wires in the bundle is eleven, six of these (in three pairs) are iron, and on these the force of *compression* is exerted. The force of extension is applied to four brass wires (two pairs), arranged alternately with the iron wires around the centre, and also to a single brass wire in the centre (which single brass wire is the equivalent of a pair).

It will be seen that the above arrangement makes the first pair of iron rods form the *base* of the Thermometer, and the last (single) brass wire the terminus.

The base of the bundle of rods is secured against a proper foundation in a *pendant* position: on this foundation is placed the support for the fulcrum of a very strong lever, bearing on knife edges. The short arm of the lever is connected with the central brass wire of the bundle, and multiplies the *difference* of the rates of expansion of the two metals composing it eight times; a second lever still further repeats this five times. The long arm of the second lever, by means of a chain (made of flat links and rivets), communicates movements to a pulley resting on friction wheels, which pulley is made in two parts, one of which is eight times larger than the other (allowance being made for the semi-diameter of the chain on the smaller portion of the pulley).

A slender silk cord runs over the larger part of the pulley and sustains a delicate weight, which is guided between two slender parallel rods (brass wire No. 32 wire measure), which parallel rods are kept in tension by means of springs.

The above comprehends the essential features of the Thermometer. All the parts should be constructed with as much nicety of adjustment as a fine watch, and with the exception of the two metals in the rods, and perhaps the knife edges and shafts or pivots of the friction wheels, the whole work should be of brass, of a uniform quality and temper as near

(Continued on page 316.)

BIOGRAPHICAL NOTICE OF THE LATE THOMAS NUTTALL.

Thomas Nuttall, an Englishman by birth, but an American by his scientific labors and reputation, was born in 1786, in the market-town of Settle, in the West-Riding of Yorkshire, of parents apparently in humble circumstances. At an early age, and scarcely possessing anything more than the rudiments of education, he was apprenticed to the printing business, either in his native town or in the city of Liverpool, where he had an uncle engaged in the same occupation.

Nuttall resided several years in Liverpool, working as a mere journeyman printer. A misunderstanding with his relative, upon whom he was somewhat dependent, induced him to leave that city and go to London in search of employment. There he met with troubles and pecuniary embarrassments, being sometimes, as he has related himself, so destitute of money as to be uncertain, on going to bed, where he would get his breakfast next morning. A love of the natural sciences, he said,—and perhaps also a hope to improve his position in the world,—brought him to the United States in 1808, when only twenty-two years of age.

Young Nuttall was endowed with a strong, clear intellect; his mind was of a meditative cast, and his thoughts were more particularly bent towards the contemplation of the great works of Nature, which became the objects of his investigations for the remainder of his life. Those who remember him, at the period of his arrival in Philadelphia, speak of him as being already a well-informed young man, possessing the language and history of his country, and somewhat familiar with some branches of natural history, and even with Latin and Greek. Such an acquisition of knowledge in a youth of twenty-two, who, at a tender age, had been removed from the benches of a village school to be apprenticed to a mechanical occupation,

calls forth the natural inquiry, "How did that young man find time to study?" The inference may justly be this: his hours of rest from labor, his hours of recreation and sleep were diligently employed in the pursuit of knowledge. Nay, at the very printing-case do we fancy to see him carrying books and stealthily devouring their pages.

These studious habits, which elevated him finally to the high rank he attained in sciences, followed him throughout his long career. When, in 1824, Prof. Torrey was preparing for publication his Flora of the Northern and Middle States, which he dedicated to his friend Thomas Nuttall, with high compliments, the printer who was engaged upon it asked the Professor who was that Nuttall so frequently referred to in his work, adding that he had once worked with a printer of that name, who spent the greatest part of his time in reading books, and he would not be surprised if he were the same man. Prof. Torrey rejoined, "that his surmise was correct; the printer of former times had proved a most arduous laborer in the field of science, and was now a distinguished botanist, and an officer of one of the first scientific institutions of the country."

Nuttall landed at Philadelphia in the spring of 1808. "In the ship Halcyon," does he say, emphatically, in the beautiful preface to his Sylva, "I arrived at the shores of the New World; and after a boisterous and dangerous passage, our dismasted vessel entered the Capes of the Delaware, in the month of April. The beautiful robing of forest scenery, now bursting into vernal life, was exchanged for the monotony of the dreary ocean and the sad sickness of the sea. As we sailed up the Delaware my eyes were riveted on the landscape with intense admiration. All was new; and life, like that season, was then full of hope and enthusiasm; the forests, apparently unbroken in their primeval solitude and repose, spread themselves on either hand as we passed placidly along. The extending vista of dark pines gave an air of deep sadness to the wilderness. The deer, brought to bay and plunging into the flood from the pursuit of the Indian,

alone seemed wanting, to realize the savage landscape as it appeared to the first settlers of this country."

That Nuttall had already devoted himself to the study of some branches of natural history, cannot be doubted. Mineralogy seems to have been his earliest and favorite study; but as to Botany, in which he has acquired his great reputation, it is evident, from the following anecdote, related by himself, that he was totally ignorant of its first principles. The morning after his arrival in Philadelphia, anxious to see the surrounding country, he crossed the High Street Bridge, and walked along the Lancaster Turnpike. In a marshy ground by the road his attention was attracted to a spot where a common Greenbrier (*Smilax Rotundifolia*) was creeping up a tree. Egad! said he to himself, there is a Passion-Flower; and he plucked some branches of it, which he brought home for inquiry. His fellow-boarders could not satisfy him, but referred him to a certain Professor Barton, a great botanist, whose residence was near at hand. Nuttall, without loss of time, and with the branch of the presumed Passion-Flower in his hand, called on Prof. Benjamin Smith Barton, and this first visit decided his vocation to the worship of Flora, to whose shrine he remained devoted to the last day of his life.

Prof. Barton received Nuttall with his usual politeness; and struck with the intellectual countenance of the young man, he invited him to a seat, and entered into conversation with him, pointing out the difference between the two genera, *Smilax* and *Passiflora;* and beginning a dissertation upon the principles of Botany, and the infinite pleasure which this beautiful science afforded to its votaries. Nuttall, on taking leave of the Professor, felt deeply impressed with the words that had fallen from his lips, and from that moment he determined to apply himself to the study of plants.

An intimacy between those two remarkable men was thus the consequence of a great botanical mistake in the future eminent botanist and great explorer of the North American Flora. It was then early in the spring of the year, and during the whole season of flowers, our enthusiastic young naturalist rambled over the neighboring fields, bringing his

treasures to his friend and patron, studying them with him, and preparing them for the herbarium. His earliest botanical excursions out of the vicinity of Philadelphia were in the lower part of the peninsula, between the Delaware and Chesapeake, and subsequently on the coast of Virginia and North Carolina. So zealous was he in the pursuit of his vocation, that he was deterred by no trifles. At the season of the year when, in the Southern swamps, the musquitoes were very numerous, and had made such an impression upon his face and hands as, unconsciously to himself, to give him the appearance of a man attacked with small-pox, upon approaching a habitation he was refused admittance by the people of the house, and with difficulty could he persuade them that he was only bitten by insects.

On his return from those explorations, he made the acquaintance of Mr. John Bradbury, a Scotch naturalist, who had come to America for the purpose of visiting the interior of the country, and to collect new objects of natural history. Nuttall, with eagerness, embraced this opportunity to gratify his ardent desire for distant travelling, and his passion for the study of Nature; he offered to accompany Bradbury, and his request was accepted. They started together from St. Louis with a party of traders and hunters, on the 31st of December, 1809, less than two years after his arrival in this country. They crossed the Kansas and Platte rivers, passed through different Indian tribes, reached the Mandan villages, where Lewis and Clarke had spent the winter of 1804 and 5, ascended still higher the Missouri River, and returned, after having experienced the greatest fatigues and dangers. They were pursued and robbed by the Indians, and Bradbury fell into their hands, and was very near being massacred by them; he only saved his life by taking his watch to pieces, and distributing the works among them as trinkets. As to Nuttall, overcome by fatigue and hunger, driven to despair in the midst of the wilderness, and unable to go a step farther, he laid himself down with resignation, and would inevitably have died, had he not been found by a friendly Indian, who

placed him in his canoe and rowed him down the Missouri River to the first settlements of the white men.

Nuttall returned to Philadelphia from this journey up the Missouri, in the beginning of 1811, bringing with him ample treasures of plants, seeds, minerals, and other objects of natural history. For eight consecutive years, he remained settled in our city, occupying his summer months in botanical excursions to the banks of the Ohio, through the dark forests and brakes of the Mississippi, to the distant lakes of the northern frontier, through the wilds of Florida, &c. During the inclement season, he employed his time in studying his collections, and preparing his materials for his admirable work, "*The Genera of the North American Plants.*"

Naturally reserved, little fond of company, and absorbed by his studies, his circle of acquaintance was very limited. Professor Barton, Messrs. Zaccheus Collins, Reuben Haines, Correa de Serra, a few other devotees of science, and three or four families of Philadelphia and Germantown, were the only persons whom he visited. To them he frequently spoke of his mother and a favorite sister, for whom he expressed great tenderness; otherwise, his habitual intercourse was with the principal horticulturists of the vicinity, with William Bartram, Col. Carr, with McMahon, to whom he dedicated his genus *Mahonia*, and others. The seeds of the numerous new species of plants, which he had brought with him from his explorations, he raised himself, and cultivated in their conservatories, with the view to study them more accurately, and distribute them to correspondents at home and abroad. He visited them alternately, spending sometimes with them several days at once. Col. Carr, the only surviving member of these old horticulturists, tells me that Mr. Nuttall had a room expressly reserved for him at his house, called *Nuttall's room*, which he occupied occasionally for a whole week.

In 1817, Mr. Nuttall, already a fellow of the London Linnean Society, was elected a member of the American Philosophical Society, and corresponding member of the Philadelphia Academy of Natural Sciences. This double election placed him at once in contact with the learned com-

munity and elite of the Philadelphia circles. He began, at that time, to publish scientific essays in the Journal of the Philadelphia Academy of Natural Sciences:—1st, *Observations on the genus Eriogonum, and order Polygonaceæ;* 2d, *An account of two new genera of Plants; of a species of Tillea, and another of Limosella, recently discovered on the banks of the Delaware, in the vicinity of Philadelphia.* 3d, *Description of Collinsia, a new genus of Plants*, dedicated to his friend and patron, Z. Collins.

The *Genera of the North American Plants* was published the ensuing year, 1818, in two vols. 12mo. Upon this work, principally, stands the reputation of Mr. Nuttall, as a profound botanist. Professor Torrey, in the preface to his Flora, justly remarks, "that it has contributed, more than any other work, to the advance of the accurate knowledge of the plants of this country." It is well known that he set up himself the best part of the types, and such was his accuracy in type composition, that some parts of his work were set up without a single error, and others, even without copy, reduced to writing.

Mr. Nuttall had long entertained the idea of visiting the regions of the Arkansas as a fresh field of exploration, promising to afford him an abundant harvest of new and interesting materials. In this enterprise he was assisted by Messrs. Correa de Serra, Z. Collins, Wm. Maclure, and John Vaughan, who procured him the means to perform this distant and hazardous journey.

He left Philadelphia on the 2d of October, 1818, and passing through Pittsburg, and down the Ohio and Mississippi, arrived at the mouth of the Arkansas River, on the 13th of January. He reached the post of Arkansas on the 22d following, and Fort Bellepoint on the 24th of April. There he left the river Arkansas to ascend on foot the Pottoe, one of its tributaries, and, with Major Bradford and a company of U. S. soldiers, he proceeded across the wilderness to the confluence of the Kiameska and Red Rivers. Hence he returned to the garrison of Bellepoint with abundant collections. Having there obtained accommodation in the boat of a gentle-

man, proceeding to a trading establishment at the confluence of the Verdigris River, one hundred and thirty miles distant, he ascended again the Arkansas up to the Grand River, and made an excursion to the Osage salt-works. On his return to the trading establishment of the Verdigris, he set out again on foot to the Salt Lake River, the western limit of his journey.

It was then the middle of August; the heat was excessive; but could not abate the unconquerable ardor of our explorer. At last, wearied by long and difficult marches, under the rays of a burning sun, suffering from thirst, insufficient food, as well as from exposure to the night dews; being, moreover, harassed by the necessity of constant vigilance, to avoid being entrapped by the neighboring Indians, his constitution sunk under so many trials of body and mind. He was seized with violent fever, among the Osage tribe, from whose treachery and dishonesty he experienced both losses of effects and perils of life, and was long deprived of the pleasures of his usual excursions. He finally succeeded, with much trouble and sufferings, in reaching the garrison of Bellepoint, where he remained sick until the 16th of October, when he started again to visit the hot springs of Washita. On the 3d of November following, he arrived at Fort Pecannerie, now Lewisburg, on his way home, and reached New Orleans on the 18th of February, 1820, his constitution much impaired. Thus did Nuttall, in his enthusiastic love of science, perform, in the space of sixteen months, an arduous and perilous journey of more than five thousand miles, mainly over a country never visited before by scientific explorers, and still in the undisputed possession of the wild Indian.

Mr. Nuttall had returned to his old quarters in Philadelphia, early in the spring of 1820. With his usual activity and perseverance, he went immediately to work, arranging his Arkansas collections, and preparing the narrative of his journey, which he published the following year, under the title of, *Journey into the Interior of Arkansas in* 1818 *and* 1819, with an Appendix, consisting,—1st, of *An Account of the ancient aboriginal Population of the Banks of the Missis-*

sippi; 2d, *A History of the Natches;* 3d, *Observations on the Chickasaws and Choctaws;* 4th, *Meteorological Observations.*

From 1820 to 1822, he contributed the following memoirs to the Journal of the Academy of Natural Sciences:—*A Geographical Description of the Valley of the Mississippi. Descriptions of rare Plants recently introduced into the Gardens of Philadelphia. Observations on the genus Orysopsis. Remarks on the Species of Corallorhiza indigenous to the United States. On the Serpentine Rocks of Hoboken, and the Minerals which they contain.* About the same time, he was also engaged in mineralogical studies, with some rude attempts at chemical analysis; and in delivering lectures on Botany to classes of young men. His style of lecturing was not remarkable for its eloquence, but he always succeeded in inspiring his pupils with his warmth and passion for his favorite science.

At the end of 1822, Mr. Nuttall was called to Cambridge, to fill, in the Harvard University, the place of the late Mr. Peck. He was not elected Professor of Natural History, but simply appointed Curator of the Botanic Garden, the fund of the Massachusetts Professorship of Natural History being insufficient for the support of a professor. Mr. Nuttall had consequently but light duties of instruction assigned to him. He delivered only occasional lectures on Botany to the students and residents of Cambridge; his time was almost exclusively devoted to the culture of rare plants and to his favorite studies, mineralogy and ornithology included. While at Cambridge, Mr. Nuttall led very much the same retired life that he had done in Philadelphia; he made few acquaintances, and the late Mr. James Brown was, perhaps, his only intimate friend. The house which he then occupied, and which is now the present habitation of the Professor of Botany, retains yet traces of some ingenious arrangements to favor his recluse habits.

During the first six or seven years of his residence in Cambridge, Mr. Nuttall paid a visit to Philadelphia in company with several gentlemen of Boston, on their way to the coal and iron districts of Pennsylvania. Joined by Dr. Pickering, they proceeded to Pottsville; hence over the mountains

to the Susquehanna, and up its west branch as far as the crossing of the Alleghany ridge.

Mr. Nuttall, aware that he was doing little for science, did not relish much his residence at Cambridge; he used to say that he was only vegetating, like his own plants. At last, his friend, Mr. Brown, induced him to write a work on Ornithology, a science which he had been cultivating almost since his arrival in this country. He set to work with great zeal, and, in 1832, produced his "*Manual of the Ornithology of the United States and Canada.*" That work, framed on Temminck's admirable treatise on European Ornithology, was published at Cambridge, in two volumes of about six hundred pages each, illustrated by excellent wood-cuts. It is written in elegant and graceful language, and is a production very creditable to Mr. Nuttall, and an evidence of the energy and perseverance with which he could apply himself, almost simultaneously, to the study of several branches of natural sciences. About the same time, appeared his "*Introduction to Systematic and Physiological Botany,*" a rare little book, which was favorably reviewed in Silliman's Journal. During his residence at Cambridge, he also published in the above journal the following papers, viz.: "*A Catalogue of Plants from Florida;*" "*Remarks on the Minerals of Paterson and Sparta, New Jersey;*" and his "*Reply to Mr. Seybert.*" In the Journal of the Academy of Natural Sciences, his "*Remarks and Inquiries concerning the Birds of Massachusetts.*" In the Transactions of the Philosophical Society, "*A Description of a new Species of Sarracenia.*" And in the American Journal of the Medical Sciences, "*An Account of the Jalap Plant as an Ipomœa,*" appended to a paper on the subject by Dr. R. Cox.

Towards the beginning of 1833, Mr. Nuttall returned to Philadelphia, bringing with him a collection of plants gathered by Capt. Wyeth, during a journey overland to the Pacific. Capt. Wyeth was soon to start on a second expedition, and Nuttall had decided to accompany him; but, not succeeding in obtaining a prolonged leave of absence from the college authorities at Cambridge to perform this long

journey, he concluded to resign his office of Curator of the Botanic Garden. During his short residence in our city, preparatory to his arduous journey across the continent, he was assiduously engaged at the Academy of Natural Sciences, studying Capt. Wyeth's plants, and preparing his memoir on those which he had collected himself in the interior of Arkansas. The result of these labors was the publication of several valuable papers in the Journal of the Philadelphia Academy of Natural Sciences: 1st. "*A Catalogue of Plants collected chiefly in the Valleys of the Rocky Mountains, towards the source of the Columbia River, by Nathan B. Wyeth.*" 2d. "*Collections towards a Flora of the Territory of Arkansas.*" 3d. "*Descriptions of some of the Rarer Plants indigenous to the United States.*"

Indeed, Mr. Nuttall was a most indefatigable laborer in the domain of science. From morning until night, he was seen working in the Academy, scarcely ever leaving his task to attend to his meals. There, at that time, I made the acquaintance of the great American botanist,—I say *American*, because no other name could be given to him, his reputation belonging to this continent, as he has specially been the illustrator of the North American Flora, and of no other. His appearance and manner made a lasting impression upon those who approached him. He was a remarkable-looking man: his head was very large, bald, and bore the marks of a vigorous intellect; his forehead expansive, but his features diminutive, with a small nose, thin lips, and round chin, and with gray eyes under fleshy eyebrows. His complexion was fair, and sometimes very pale from hard labor and want of exercise. His height was above the middle; his person stout, with a slight stoop; and his walk peculiar and mincing, resembling that of an Indian.

Nuttall was naturally shy and reserved in his manners in general society, but not so with those who knew him well. If silent or perhaps morose in the presence of those for whom he felt a sort of antipathy, yet, when with congenial companions, he was affable and courteous, communicative and agreeable. From long solitary study, the cast of his mind was contem-

plative and abstracted; but when doubts and difficulties were solved, he was apparently light and buoyant. "At the conclusion of a piece of work," says one who has been most intimate with him, "I have seen him rise from his chair, approach the stove, and, in his own peculiar way, put his hands behind his back, and, for an hour or two, pour forth a torrent of narrative and scientific facts on which was the cast of his own philosophical thoughts and conclusions. I have frequently seen him in social circles, when he was the delight of the company, from his cheerful and natural replies to all interrogatories, and his voluntary details upon the subject of his travels and adventures."*

I may be permitted here to relate a few anecdotes characteristic of the great naturalist. In one of his solitary excursions in the wilderness Nuttall got lost, and not returning, the party did not wait for him, but resumed their march, sending out some friendly Indians to look for him and conduct him upon his journey to rejoin the company. The Indians performed their duty faithfully. Looking upon him, however, as a great medicine man, they were afraid to approach him. They therefore surrounded him, and kept at a respectful distance. Nuttall was soon aware that he was watched by savages, and not knowing their character, whether friends or foes, he was in the greatest state of alarm. From all he had already experienced at their hands, he had the utmost horror of the Indians. Therefore hiding himself, and taking advantage of every ravine, every tree and bush, he succeeded in regaining the track of the caravan, which he followed for three days without food or sleep, when, to his infinite delight, he overtook it and was relieved from his anxieties.

On another occasion Nuttall was rambling in the vicinity of the camp, when a band of Indians, apparently hostile, made its appearance. The alarm was immediately given, with orders to arm and be ready for the expected attack; but Nuttall was not among them. A friend, uneasy about him, ran in search

* This delineation of Mr. Nuttall's person and character has been furnished to me by Prof. Carson, to whom, as well as to Dr. Pickering, Mr. Lea, and other friends, I owe many of the details herein mentioned.

of him in the direction he had taken. It was not long before he perceived the great naturalist, at some distance, quietly occupied in examining a plant. He hailed him, with signs to return quickly. "We are going to have a brush with the Indians," said he, "is your gun in good order?" Alas! the gun had been freely used to uproot plants, and was filled with gravel to the muzzle. Had Nuttall used it in this condition, it would inevitably have burst in his hands and killed or wounded him severely.

In crossing over the Rocky Mountains the caravan separated in two parties, each following a different route and having rendezvous at Fort Hall. One of the parties had the good fortune to meet with plenty of buffalo cows, upon which they freely feasted and became fat. The other, on the contrary, to which Nuttall belonged, suffered much from fatigue, and scarcely found anything to eat except a few lean grizzly bears. On arriving at Fort Hall, Nuttall had lost so much flesh that his old companions could scarcely recognize him; and upon one of them expressing his surprise at the great change in his appearance, he heaved a sigh of inanition, and retorted: "Yes, indeed, you would have been just as thin as myself, if, like me, you had lived for two weeks upon old Ephraim (grizzly bear), and on short allowance of that too!"

Mr. Dana, in his book "Two Years Before the Mast," relates an amusing anecdote of Nuttall, who was a passenger on board the same vessel. While opposite Cape Horn, and close to the land, his passion for flowers revived at once, and he entreated the captain to be put ashore, that he might make acquaintance with the vegetation of this dreary spot. The wind was then blowing furiously, and the vessel surrounded with icebergs and in danger of being wrecked. Still, Nuttall, undaunted by any circumstance, insisted upon being landed, even for a few hours. His request, of course, was sternly refused by the captain, to the great disappointment and displeasure of our naturalist, who could not conceive such an indifference for the cause of science in a seafaring man.

Nuttall was excessively economical in his habits and careless about his dress; none of his Philadelphia friends, I be-

lieve, ever knew where he resided, nor in what manner he lived. The profession of savant is not a very profitable one, yet with the few opportunities he had to advance his interest, he had succeeded, through the most strict saving, in laying aside a competency for his old age, even had he not inherited the estate of Nutgrove. He once travelled on foot to Westchester in his usual travelling dress, carrying his provisions with him, and a basket of minerals which he intended exchanging for Westchester specimens. Without stopping at any hotel, he visited the mineralogists of the place, and having accomplished his object, the gentleman with whom he had made exchanges, asked him where he would send the package, and what direction he would put on it? Nuttall answered simply to write Thomas Nuttall, and he would call himself for it. At this name, so well known by scientific men, the gentleman retorted, "Any relation, sir, to the great botanist?" "I believe, himself," said Nuttall. Upon this he was cordially invited to a more tempting dinner than that he was carrying in his basket.

At last the time appointed for the departure of Captain Wyeth's expedition was at hand, and Nuttall bade adieu to his Philadelphia friends. He was accompanied by Mr. John K. Townsend, a young naturalist who was sent out on the joint account of the Philosophical Society and of the Academy of Natural Sciences. The expedition was undertaken by the Columbia Fishing and Trading Company, for the purpose chiefly of establishing trading-posts beyond the Rocky Mountains and on the coast of the Pacific. Capt. Wyeth had collected at St. Louis and Independence a party of men to cross the continent, and this party Messrs. Nuttall and Townsend joined at St. Louis on the 24th of March, 1834. On the 29th following, they both started on foot from the capital of Missouri, arrived at Fulton on the 6th of April, and at Brownville on the 8th.

There they were joined by Capt. Wyeth, and embarked with him on a steamer for Independence, where the whole party had rendezvoused. "On the 28th of April," says Mr. Townsend, "at 10 o'clock in the morning, our caravan, consist-

ing of seventy men and two hundred and fifty horses, began its march. Capt. Wyeth and Milton Sublette took the lead, Mr. Nuttall and myself beside them; then the men in double file, each leading with a line two horses heavily laden; Capt. Thing (Wyeth's assistant) brought up the rear; then the band of missionaries, with their horned cattle, rode along the flanks, and they proceeded over

> 'Vast savannas, where the wandering eye,
> Unfixt, is in a verdant ocean lost,'

across the arid plains of the far West, beyond the steppes of the Rocky Mountains, down to the Oregon, and to the extended shores of the Pacific."

I shall not follow our bold adventurers in their long and perilous journey, so well described in Mr. Townsend's narrative.* They successively crossed interminable green plains and great sandy wastes, grassy glades and black hills, high mountains and delightful valleys, along refreshing streams; suffering from fatigue, thirst, and hunger; tormented by gnats, constantly alive to the danger of the short rattlesnake of the prairies, of the grizzly bear, that formidable inhabitant of the mountain, and withal to the arrow and tomahawk of the savage and treacherous Indian, always prowling about the white men's caravans to steal or murder. But what's all that, if our naturalists can gather the harvest of the cherished objects of their explorations? "To me," said Mr. Nuttall, "hardships and privations are cheaply purchased, if I may but roam over the wild domain of primeval Nature, and behold

> 'Another Flora there, of bolder hues,
> And richer sweets, beyond our garden's pride.'

How often did I realize the poet's buoyant hopes amidst my solitary rambles. My chief converse has been in the wilderness with the spontaneous productions of Nature; and the study of these objects and their contemplation have been to me a source of constant delight."

* Narrative of a Journey across the Rocky Mountains to the Columbia River, &c. Philadelphia, 1839.

On the 3d of September, they came in view of the noble Columbia River; they descended its course partly on foot, partly in canoes, and stepped on shore at Fort Vancouver, the end of their journey across the continent. Six months and three days had elapsed since they had left Philadelphia. Such was the first part of this adventurous journey. They remained at Fort Vancouver the rest of the autumn, still exploring the environs of the Fort, and revisiting the fertile Valley of the Walla-Walla; but, anxious to escape the wet and unpleasant winter of that region, and to visit other parts where the inclemency of the season could not interfere with the prosecution of their respective pursuits, they took passage on board a Boston brig, ready to sail for the Sandwich Islands. They put to sea towards the middle of December, and landed on the Island of Oahu, on the 5th of January, 1835.

Here, for the first time, Mr. Nuttall enjoyed the beauties of a tropical vegetation, "a climate that knows no change, but is that of a perpetual spring and summer." There he remained a couple of months, visiting the different islands of that happy group, and collecting plants and sea-shells. Thence separating from his companion, Mr. Townsend, he took passage on board a vessel sailing for the coast of California, where he landed early in the spring, to enjoy new emotions of pleasure. All again was new to him! He remained in California a great part of the spring and summer, actively engaged in making collections, and returned to the Sandwich Islands, where he embarked on a Boston vessel, to come back to the United States, round Cape Horn.

Mr. Nuttall arrived in Boston in the beginning of October, 1835. When he went to the counting-house of Messrs. Bryant & Sturges, the owners of the vessel which had brought him home, with the view to pay for his passage, these gentlemen courteously refused to receive the money of one who had been travelling, not for his own amusement, but for the benefit of mankind!

Upon his return to the United States, he again took up his abode in Philadelphia, working alternately upon his rich collections of plants, minerals, and land and sea shells. In the small room of the Academy, then corner of Twelfth and George

Streets, Mr. Nuttall and Dr. Pickering were always seen working together; one at his own collections, the other on the Schweinitz Herbarium. These two great naturalists lived in the most perfect harmony, both being enthusiastic lovers of natural science. They were met occasionally, walking together, on a fine day, visiting the different gardens and conservatories of the neighborhood. In these walks, Nuttall would freely relate the particulars of his life; he spoke of having expectations in England; that an uncle who had succeeded in his business, had assured him he would be his heir. He mentioned having set up with his own hands, the types of an edition of one of Priestley's works, and gave also an account of his first visit to Professor Barton, and of the beginning of his botanical studies, &c.

Conchology was then a new object of study to Mr. Nuttall. He took much interest in it, usually spending the daylight in the Academy building, without troubling himself about his meals. Dr. Pickering, after an hour's absence in the middle of the day, would sometimes find him stooping over one of the cases of shells, as unmoved as a statue, in the same place and position as when he left him.

In 1840, Mr. Nuttall published in the Transactions of the American Philosophical Society, a long and interesting memoir, entitled: "*Descriptions of new species and genera of plants in the natural order* COMPOSITÆ, *collected in a tour across the continent to the Pacific, a residence in Oregon, and a visit to the Sandwich Islands and California, in the years* 1834 *and* 1835." And soon after another paper, headed: "*Description and notices of new and rare plants of the natural orders* LOBELIACEÆ, CAMPANULACEÆ, VACCINIEÆ and ERICACEÆ, *collected in a journey across the Continent of North America, and during a visit to the Sandwich Islands and Upper California.*" Having then been induced to write an appendix to Michaux's Sylva, he entered upon this undertaking with his usual energy, and completed it in a very short time, but having been obliged abruptly to leave this country, the work could not be published under his auspices. The manuscript was placed in the hands of Mr. Dobson, who had been engaged to superintend its publication. At the death of this gentleman,

some of the letter-press having been found defective and rejected, the entire publication of that work was retarded for several years; it was at last completed in 1846 by the late Dr. Lambert, a protegé and pupil of Nuttall.

The preface appended to that work is a beautiful piece of elocution. In reading it, you feel carried along with him through all his adventurous journeys; you partake of his fatigues and dangers, of his feelings of awe in the midst of the wilderness, and of admiration at the sight of the luxuriant vegetation of the tropics; you enjoy his delight, amounting to ecstasy, whenever he discovers objects that have not met his eye before, and you shudder with him amidst the mountains of ice, which in an unusual array oppose his passage around Cape Horn, the dreary extremity of South America. At last, you see him landing again on the shores of the Atlantic, and in his transports of joy, he exclaims: "Once more I hail those delightful scenes of nature, with which I have been so long associated." Then, he closes his elegant peroration with this warm farewell to this country, "But the oft told tale approaches to its close, and I must bid adieu to the New World, its sylvan scenes, its mountains, wilds, and plains,—and henceforth, in the evening of my career, I return, almost an exile, to the land of my nativity!"

Poor Nuttall! Yes, indeed, he may well say "almost an exile, to the land of his nativity." He had left it thirty-four years past, and was returning almost a stranger to its people and customs. He was strongly attached to the United States. Here were almost all his associations; he had friends who were dear to him; and, wherever he went, whether in the valley or on the mountain, by the shores of the sea or the margin of the quiet stream, he felt surrounded by old acquaintances, his dearest flowers; or met, by chance, a new object for his admiration.

But an uncle, without family of his own, had bequeathed to him an estate, called Nutgrove, in the neighborhood of Liverpool, and he must go and take possession of it. The will was incumbered with a clause most distasteful to him, requiring him to reside at least nine months of the year in England for the remainder of his life. He hesitated, for a

considerable time, whether to accept the inheritance, with its restrictions; but consideration for his sisters and their families, induced him at last to go to England, and take the rural estate left to him. He returned only once to this country after this; and, as he could not be more than three months absent in the year, he took the three last months of 1847 and the three first of 1848, thus passing with us about five months of the inclement season, when the nature he loved so much was dead to him, only to revive when he was forced to turn his back upon her.

In this short visit, his usefulness at once revived. Finding himself at the Academy, among his old associations, with materials at hand, he at once set to work, and studied the plants brought by the late Dr. William Gamble, from the Rocky Mountains and Upper California; the descriptions of which were published in August, 1848, in the Journal of the Academy of Natural Sciences.

It does not appear that the bequest of the Nutgrove estate had placed Mr. Nuttall in a position of affluence. The estate was, it is said, incumbered with annuities, and burdened with a heavy income tax. He had, moreover, a numerous family of relatives to support. By his old American friends, who visited him at his English abode, he was found living in the fashion of a plain farmer, working on his grounds and nurseries among his men, like one of them, and eating at the same table with them. He used to say that it was difficult, in England, to enjoy the benefits of a moderate fortune, for the government took good care to exact the superfluous.

When, in April, 1854, Dr. Pickering visited Mr. Nuttall at Nutgrove, he perceived him, on entering his grounds, stooping on one knee, examining a growing plant. Nuttall, turning his head and recognizing his old friend, arose and came forward, saying—"How strange it seems to me to see you in this country!" He invited him in, and they spent several hours together, conversing about old acquaintances, walking through his conservatories, and looking over his collection of living Rhododendrons. Dr. Pickering saw him again some months after, and perceived a change that he could scarcely account for, namely,—that he who had been accustomed to

roam thousands of miles all over North America, in times when it was really dangerous to do so, should now attach importance to and speak emphatically of having derived great satisfaction of a single visit to Ireland, and further, should have never visited the continent of Europe, close at hand.

Mr. Nuttall spent the last seventeen years of his life on his estate of Nutgrove, employing his time in the culture of rare plants, and especially Rhododendrons, which his nephew, Mr. Thomas J. Booth, had brought with him from the mountainous districts of Assam and Bootan, in Eastern Asia, and the new species of which he has published, at different times, in British scientific periodicals. At last, after a long and laborious life, entirely devoted to science, the great explorer of American botany met with an accident which ultimately resulted in his death. In his eagerness to open a case of plants which he had just received from Mr. Booth, he unfortunately overstrained himself, and from the time of his injury he gradually sunk and died, on the 10th of September last (1859), at the age of seventy-three, leaving, I am told, his estate and collections to his nephew and pupil, Thomas J. Booth, like himself an ardent naturalist and daring explorer.

Through his love of study, firmness of mind and devotion to the natural sciences, Mr. Nuttall raised himself, from the condition of a mere artisan, to the exalted position of a highly scientific man. No other explorer of the botany of North America has, personally, made more discoveries; no writer on American plants, except perhaps Professor Asa Gray, has described more new genera and species. His name will live as long as our Flora remains an object of study, and will be perpetuated, among the cherished objects of his particular attention, in a beautiful genus of the order Rosaceæ, *Nuttallia cerasiformis*, which his friends and colleagues, Professors Torrey and Gray, have dedicated to him. Let this great naturalist be set up as an example to young men similarly disposed, and an evidence that steadiness in the pursuit of knowledge will have its reward, and may lead to eminence. Honor to the memory of him to whom science is so much indebted, who so long lived in our midst, respected and loved for his usefulness, his unaffected manners, and amiability in the social circle!

(Continued from page 296.)

as practicable. The first lever should be very strong and light, and for this purpose may be made of skeleton form, of considerable lateral dimensions, or rather *vertical*, the lever being in a horizontal position and acting vertically. The second lever and pulley are very delicate and slender.

The position of the pulley, as above arranged, enables me to place a dial over it, with an index attached to the projecting shaft of the pulley.

One solid plate of metal (brass) forms the support and union of all the parts sustaining the rods, levers, and pulley. The lower extremity of the *parallel rods* being held by springs, may not necessarily have a continuous metallic support from the other parts.

The second part of the apparatus does not require the nice mechanical precision of the first part; its purpose being merely to record the indications of the Thermometer.

The recording portion of the apparatus consists of a train of cylinders carrying a fillet of paper, the axes of the cylinders being parallel with the parallel wires which guide the registering point of the Thermometer.

One of these cylinders presents the surface of the paper to the registering point, which passes very near, but not in contact with it, the movements of the registering point being across the paper. A series of *levers* and *springs*, which cannot be well described without diagrams, gives the proper "feed" to the cylinders and paper. But as this part of the apparatus is susceptible of an endless variety of modifications, it is unnecessary to speak of it further.

Connected with the cylinders is a hammer, made with reference to the *width* of the fillet of paper. This hammer imparts the necessary force to the registering point to make a small hole in the paper fillet, and is, when not in action, held from contact with the registering point by means of a recoil spring, which spring is adjustable by means of a screw. The levers connected with the feed of the cylinders are operated by the back movement of the hammer.

The third part of the apparatus consists of a common ma-

rine clock, with jewelled movement, to secure its action in cold weather. In practice, it will be necessary to have clock movements constructed with special reference to the number of records it is desired to obtain. A common thirty-hour clock, in order to have the necessary power to move the *hammer*, requires to have each alternate pin removed from the wheel that actuates the hammer lever; the lever requires, also, to be modified so as to accommodate the change. This change, if quarter-hourly records be required, will make it necessary to re-wind the clock too often.

My apparatus has the striking part of a clock constructed to move both the time and striking trains, as the equivalent of the *striking part* of one clock; the whole service of the spring being turned upon the striking train—the time train being removed, its space being occupied by the necessary levers. A marine clock, with time movement only, imparts the *time* to the striking part, very much as in any ordinary clock, except that the shaft of the minute wheel has *four* projections instead of one, so that I can obtain records four times each hour. A peculiar arrangement, difficult of description, enables me to change the rates from quarter-hour to half-hour, or hour movements of the hammer.

In describing the Thermometer, I omitted to mention that the lower end of the central brass wire in the bundle of compensated rods, was furnished with an adjusting screw, by means of which the index and registering point may be adjusted to any desirable point.

My fillet of paper is $2\frac{3}{4}$ inches wide. This enables me to obtain a range of nearly 50° without shifting the position of the registering point. In a trial of one week I have not found any occasion to readjust the index and registering point. I have much difficulty, however, in the *scale* of my apparatus, and this arises from using a mercurial thermometer as a standard of comparison, the tube of which is probably unequal in its dimensions in various parts, and the scale not corrected to correspond. At first, I constructed my scale from temperatures —10° to +80°, about 164° on my dial. Subsequent comparisons show that between 30° and 40° of the

Mercurial Thermometer, 10 of the Mercurial Thermometer correspond to 9 of my dial. I have, therefore, no dependence on the mercurial instrument I have, especially as no ten degrees of the two instruments will agree, except the 10 on which a correction is made, although they agree over a long range at extremities.

In presenting this account of my apparatus, I *desire* that a knowledge of it may be made widely public, for the benefit of those scientific men who may appreciate it, and desire to use a similar apparatus constructed under their own supervision. The details of all the parts are susceptible of numerous modifications. I have not so much devoted my attention to the *best* arrangement of *all* the parts, but have confined my efforts more particularly to perfecting the *Thermometer* in that form which will make it most reliable and least susceptible of improvement. The *rods* are on the outside of the case which incloses the dial, registering apparatus, and clock. The apparatus is very sensitive. The rods move the index freely to $\frac{1}{4}$ degree, and the ticking of the clock attached imparts just enough vibration to overcome resistance to a very minute fraction of a degree. Indeed, on watching the index while a slight change of temperature occurs, the index may be seen to advance or recede with the tickings of the clock, almost creating the impression that they are only parts of one movement.

Yours, JAMES LEWIS.

Pending nomination, No. 397 was read.

Dr. Wm. Harris, from the committee appointed to procure a portrait of Judge Kane, reported it finished and in the hall of the Society, and presented the bill for painting, framing, &c., which was ordered to be paid.

And the Society adjourned.